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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 05/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/043,727

Applicant(s)

KEEFER ET AL.

Examiner

Mark Ruthkosky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-46 and 70-93 is/are pending in the application.
- 4a) Of the above claim(s) 3, 10-26, 35-45, 73-77 and 79 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-9, 27-34, 46, 70-72, 78 and 80-93 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 27-34, 46 and 80 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recitation in claim 27 of "an oxidant-enriched gas" is indefinite because a standard of comparison of "enriched" is not given. Presumably the gas should contain more oxidant than another standard gas, but the oxidant concentration of the standard gas is not given.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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Claims 1, 2, 4-9, 70, 72 and 78 stand rejected under 35 U.S.C. 102(b) as being anticipated by Singh et al., (US Patent 5,686,196.)

Newly added claims 81-86 are rejected under 35 U.S.C. 102(b) as being anticipated by Singh et al., (US Patent 5,686,196.)

Singh et al. discloses a system for operating a fuel cell, which includes a solid oxide fuel cell, fuel storage containers, and an expander. The system includes both hydrogen and diesel fuel as fuel, and includes storage containers for both. The high-pressure reformed fuel is delivered to an expander, which depressurizes the reformed fuel for delivery to a conventional solid oxide fuel cell. (See column 4, lines 53-58.) With regard to claims 4, 5, 70 and 72, the hydrogen storage component of fuel storage may include a bed of hydrogen storage alloy as a gas sorbent, or a cryogenic storage system, (column 4, lines 15-36.) With regard to claim 6, the expander is coupled to pumps as shown in Fig. 1. With regard to claims 7, 8, and 78 the ambient atmosphere is a heat exchanger, which contains air as a working fluid. Since the atmosphere surrounds the system disclosed by Singh et al., heat will inevitably be transferred, at least in small amounts, from the atmosphere to the fuel in the fuel storage container. Thus, the claims are anticipated.

With regard to claims 81-86, the limitations "configured to" and "configured to make use of" are intended uses of the system. Hydrogen fuel is released from a fuel storage container, which generates mechanical power with regard to the release of the gas from the container (see col. 4, lines 45-62.) The system includes a fuel transport device and when the fuel is released from the container, the fuel is transferred along a pressure path to the various elements of the system. Although the reference does not describe these effects, the fuel being released provides the structure of the system claimed. As the fuel is transported into an expander, the pressure is

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lowered and the fuel expands isentropically in the closed system (see col. 4, lines 54-62.) The expander is mechanically coupled to a fuel cell, hydrogen storage tank and condenser as shown in Figure 1. As expanders are well known in the art to be electrically powered systems, such as turbines, the expander will inherently be in communication with an electrical coupling. Thus, the claims are anticipated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 27, 28, 29, 30-34, and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et al. (US 5,686,196), in view of Ippommatsu et al. (US 5,147,735.)

Newly added claims 91-93 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et al. (US 5,686,196), in view of Ippommatsu et al. (US 5,147,735.)

As discussed above, Singh et al. disclose applicants' invention essentially as claimed, with the exception that Singh et al. does not disclose an oxidant gas delivery system that can produce oxidant-enriched gas for delivery to the fuel cell. Ippommatsu et al. discloses a solid oxide fuel cell system, which a pressure swing adsorption system (PSA) to enrich the air provided to the cathode with oxygen, (see column 4, lines 50-53 and column 3, lines 16-19.) The use of oxygen-enriched air increases the output density of the fuel cell and reduces the internal resistance of the fuel cells. (See column 3, lines 55-66.) Therefore, it would have been obvious to

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one of ordinary skill in the art to include a PSA in the fuel cell system described by Singh et al. in order to increase output density of the fuel cell and decrease the internal resistance of the fuel cell as taught by Ippommatsu et al. With regards to claim 31, the rotary pressure swing adsorption module recited by the applicants is considered to be sufficiently well known to one of ordinary skill in the art that it is encompassed by the Ippommatsu et al. disclosure of a pressure swing adsorption module.

Similarly, with regards to claims 33 and 34, multi-stage expanders and positive displacement expanders are considered to be sufficiently well known to one of ordinary skill in the art that they are encompassed by the Singh et al. disclosure of expanders. With regard to claim 74, Singh et al. do not specifically disclose the use of carbon material or zeolite as an adsorbent. Singh et al. teach purifying hydrogen prior to contact with hydrogen storage alloy, and as activated carbon is a well-known impurity adsorbent, it would have been obvious to one of ordinary skill in the art to include carbon in the hydrogen storage system taught by Singh et al. in order to remove impurities in the system, as suggested by Singh et al.

With regard to claims 91-93, Singh et al. does not disclose an oxidant gas delivery system attached to the exchanger that can produce oxidant-enriched gas for delivery to the fuel cell. Ippommatsu et al. discloses a solid oxide fuel cell system, which a pressure swing adsorption system (PSA) to enrich the air provided to the cathode with oxygen. The instant invention includes limitations which couple a compressor or a blower to the expander for adding the oxidant source to a fuel cell. All fuel cells inherently require a fuel and oxidant source, usually air or oxygen, for the fuel cell to function. It would have been obvious to one of ordinary skill in the art to include a means for supplying the oxidant, such as a blower or compressor as the

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skilled artisan recognizes that these components are commonly used to provide an oxidant source, such as air, to a fuel cell. For example, Singh teaches using a compressor for supplying fuel to the fuel cell (col. 5, lines 1-25.) The skilled artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Newly added claims 87-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et al. (US 5,686,196.)

The teachings of Singh have been presented. Singh et al. discloses a system for operating a fuel cell, which includes a solid oxide fuel cell, fuel storage containers, and an expander. The reference does not disclose the expander to be a multi-stage expander, a positive displacement expander or an impulse turbine. As the Singh reference teaches an expander to receive a high-pressure gas and release the gas at a lower pressure in the same manner used in the present invention, it would be obvious to one of ordinary skill in the art at the time the invention was made to use any expander that will provide this function. As multi-stage expanders, positive displacement expanders and impulse turbines are well known in the art as expanders used for this purpose, one of ordinary skill in the art would use these expanders as the expander to receive a high-pressure gas and release the gas at a lower pressure to the fuel cell in the invention of Singh. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Newly added claim 90 is rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et al. (US 5,686,196) in view of Hornburg et al. (US 5,981,096.)

The teachings of Singh have been presented. Singh et al. discloses a system for operating a fuel cell, which includes a solid oxide fuel cell, fuel storage containers, and an expander. The reference does not teach the expander to be coupled to a coolant pump. Hornburg et al. (US 5,981,096) teaches a system for operating a fuel cell that includes a fuel/coolant that is admitted to the anode of the fuel cell in order to cool the fuel cell. The coolant/fuel mixture is admitted by a pump that is incorporated into the system in a position that is equivalent to the position of the expander in the Singh reference, (figure, col. 3, lines 1-10.) It is further noted that the expander of Singh admits the fuel to the anode of the fuel cell in an equivalent manner. It would be obvious to one of ordinary skill in the art at the time the invention was made to couple a coolant pump to the expander as taught in Singh in order to pump coolant through the fuel cell as taught by Hornburg et al. (US 5,981,096.) It is further noted that Hornburg et al. (US 5,981,096) teaches an expander used for a different function that is coupled with an oxidant compressor. This provides motivation to the skilled artisan to couple two components on a common shaft (col. 3, lines 1-10.) The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Response to Arguments

Applicant's arguments filed 2/25/2005 have been fully considered but they are not persuasive.

Arguments in response to the rejections based on 35 U.S.C. 112: The applicant argues that the limitation of an "oxidant gas delivery system that can produce oxidant-enriched gas for delivery to a fuel cell" is definite. The applicant notes that the term "oxidant-enriched" indicates

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that the oxygen concentration in the product gas is greater than the oxygen concentration in the feed gas. This argument is not persuasive. The applicant's argued meaning of the term is simply one interpretation of the meaning of "oxidant-enriched." As written, a gas with any amount of oxidant may be considered enriched. The specification does not define the term "oxidant-enriched." The applicant's arguments, based on the inclusion of oxygen to a feed gas, do not define "oxidant-enriched" in the specification. For example, other oxidants are not precluded from the claim limitation. From this, the meaning of "oxidant-enriched" in the claims is not clearly understood and stands as indefinite.

Arguments in response to the rejections based on 35 U.S.C. 102: The applicant argues the Singh reference (US 5,686,196) does not anticipate the rejected claims because Singh does not disclose or suggest an expander that can receive fuel from a fuel storage container. This argument is not persuasive. First, the claim limitation that the expander "can receive" fuel is met by the claim. The expander "can receive" fuel from a storage container in the same manner that it receives fuel from the separator. A recitation of the intended use of the claimed invention must result in a structural difference between the expander of the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 312 F.2d 937, 939, 136 USPQ 458, 459 (CCPA 1963). Second, the teaching of Singh include a fuel storage container which stores hydrogen that is cycled through the fuel cell system, along with additional unreacted fuel, to the separator where the hydrogen is separated into two streams, one of which is fed into the fuel cell at a lower pressure (figure 1 and col. 2, lines 1-15.)

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With regard to the applicant's assertion that the ambient atmosphere does not constitute a "heat-exchanger," the examiner disagrees. It is first noted that the term "heat-exchanger" is a broad term that is not only a device added to the system, as argued by the applicant. In many arts including the fuel cell art, air or ambient atmosphere is used to cool heat-producing systems. Thus, the inclusion of the ambient atmosphere as a heat exchanger is proper both because it is broadly claimed and commonly used in the art. Second, it is noted that the proper analysis of the claims is to broadly interpret the claim language (MPEP 2111, Claim Interpretation; During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." In re Hyatt, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). Applicant always has the opportunity to amend the claims during prosecution, and broad interpretation by the examiner reduces the possibility that the claim, once issued, will be interpreted more broadly than is justified. In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969.) Thus, based on the claim limitations and the indication in the rejection that the ambient air inherently acts as a heat exchanger, the claim is anticipated.

Arguments in response to the rejections based on 35 U.S.C. 103: With regard to the arguments that the Singh reference (US 5,686,196) does not anticipate the rejected claims because Singh does not disclose or suggest an expander that can receive fuel from a fuel storage container, this argument is not persuasive for the reasons noted in the previous section.

With regard to the applicant's arguments that the teachings of Singh and Ippommatsu do not suggest a relationship with regard to the limitations of claim 27, the examiner disagrees. The applicant's arguments state that the relationship between the expander and the oxidant gas delivery system provides a "particularly useful configuration" for utilizing a portion of the

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recovered fuel storage energy and the cited references fail to disclose the recovery of fuel storage energy. As noted in the rejection, the use of an oxygen-enriched oxidant will increase the output density and internal resistance of the fuel cell. This would be clear to one of ordinary skill in the art, as an increase in concentration of the oxidant in the reactant gas will provide a higher concentration of reactive species at the catalyst layer in the fuel cell reaction. It is noted that the claims do not include limitations for the recovery of fuel storage energy.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Examiner Correspondence


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky

Primary Patent Examiner

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5/11/05**MARK RUTHKOSKY
PRIMARY EXAMINER**